

1. (Amended) A semiconductor device manufacturing method comprising the step of:

converting into a plasma a process gas selected from the group consisting of N_2 , N_2O and mixtures thereof; and

nitriding a surface portion of a copper wiring layer to convert the surface portion into a copper diffusion preventing layer by exposing a surface of the copper wiring layer to the process gas plasma.

3. (Amended) A semiconductor device manufacturing method according to claim 26, wherein the hydrocarbon is CH_4 or C_2H_2 .

4. (Amended) A semiconductor device manufacturing method comprising the step of:

converting to a plasma a process gas consisting of N_2 and NH_3 ; and

nitriding a surface portion of a copper wiring layer to convert the surface portion into a copper diffusion preventing layer by exposing a surface of the copper wiring layer to the process gas plasma.

5. (Amended) A semiconductor device manufacturing method according to claim 1, further comprising the step of:

exposing the surface of the copper wiring layer to a NH_3 plasma before the surface portion of the copper wiring layer is nitrided.

SUB
C2

6. (Amended) A semiconductor device manufacturing method according to claim 1, further comprising the step of:

forming a silicon-containing insulating film on the copper wiring layer after the surface portion of the copper wiring layer has been nitrided.

Cont
B1

7. (Amended) A semiconductor device manufacturing method according to claim 6, further comprising the step of:

converting a process gas containing at least one of NH_3 , N_2 , and N_2O into a second process gas plasma; and

after forming the silicon-containing insulating film, exposing the silicon-containing insulating film to the second process gas plasma.

8. (Amended) A semiconductor device manufacturing method according to claim 6, further comprising the step of:

forming an interlayer insulating film on the silicon-containing insulating film;

forming a via hole in the silicon-containing insulating film and the interlayer insulating film;

burying a plug connected electrically to the copper wiring layer in the via hole; and

forming an upper wiring layer, connected electrically to the plug, on the interlayer insulating film.

SUB
C27

12. (Twice amended) A semiconductor device manufacturing method according to claim 8, wherein the interlayer insulating film is a FSG film or a porous SiO₂ film.

Cond
B1

13. (Twice amended) A semiconductor device manufacturing method according to claim 6, wherein the silicon-containing insulating film is selected from the group consisting of an SiOCH film, an SiO film, an SiN film, an SiONCH film, an SiCH film, and an SiCNH film.

Please add the following new claim:

ADD
B2
SUB
C27

-26. A semiconductor device manufacturing method comprising the step of:
converting into a plasma a process gas selected from the group consisting of N₂, a hydrocarbon C_xH_y, N₂O and mixtures thereof containing said hydrocarbon; and
nitriding a surface portion of a copper wiring layer to convert the surface portion into a copper diffusion preventing layer by exposing a surface of the copper wiring layer to the process gas plasma.

REMARKS

A petition for a one month extension of time has today been filed as a separate paper and a copy is attached hereto.

The claims directed to the "non-elected invention" have been cancelled.